

containing 1 to 20 carbon atoms, or a bivalent organic group containing 1 to 20 carbon atoms;" with

-- wherein Z represents an oxygen atom, a sulfur atom, a bivalent organic group containing 1 to 20 carbon atoms or a group of the formula  $\text{NR}^1$ ; in which  $\text{R}^1$  represents a univalent hydrocarbon group containing 1 to 20 carbon atoms; -- for purposes of clarification.

Claims 2 and 3 have been amended by changing "the organic group in the general formula (1)" to read --  $\text{R}^3$  in the general formula (1) -- for purposes of clarity.

Claim 7 has been amended by deleting "or (1')" for purposes of clarity.

Claim 13 has been amended by changing "the metal complex catalyst" to read -- a metal complex catalyst -- for purposes of clarity.

Claims 16 and 18 have been amended by changing "obtainable" to read -- obtained --.

Claim 16 have also been amended by changing " $\text{M}^{+}\text{OC}(\text{O})\text{CR}^1 = \text{CR}^2\text{R}^3$ " to read --  $\text{M}^{+}\text{OC}(\text{O})\text{CR}^1 = \text{CR}^2\text{R}^3$  (2) -- for the purposes of clarity.

Claim 17 has been amended by changing "the ethylenically unsaturated group of the vinyl monomer" to read -- an ethylenically unsaturated group of a vinyl monomer -- for the purposes of clarity.

The title has been amended as requested by the Examiner. Also, a new Abstract has been provided as requested by the Examiner.

The rejection of claims 1-4, 6-9 and 11-18 under 35 U.S.C. 112, first paragraph, is not deemed tenable. The specification adequately describes the present invention so as to enable persons skilled in the art how to make and use the invention.

Eventhough a polymer that exclusively consists of molecules having 1.0 functional group cannot be cured, a cured product will be obtained even when a slight amount of a polymer containing functional groups at both termini is present in a curable composition. Generally at least a part of the vinyl polymer prepared in the manner disclosed and described, in the present

specification contains molecules having functional groups at both termini.

Here, a polymer having a functional group at one terminus is also involved in the curing reaction as an important component. Actually, a polymer having a functional group at one terminus is used for adjusting physical properties, molecular weight and the like.



Moreover, the description on page 51, line 24 through page 58, line 19 discloses monomers and oligomers which may be formulated for the curable composition. The curable composition containing this monomer or oligomer in combination with the vinyl polymer will be cured even if the polymer exclusively consists of molecules having only one function group at one molecular terminus can be an important component of the curable composition.

Therefore, there is a case in which the vinyl polymer having one functional group is formulated in a curing composition.

Consequently, the specification sufficiently and clearly describes the manner or process as to enable a person skilled in the art how to make and/or use the present invention.

The rejections of claims 1-4, 6-9 and 11-18 under 35 U.S.C. 112, second paragraph, has been overcome by the amendments to the claims and/or are not deemed tenable. Along these lines, Claim 1 has been amended to clarify that a "bivalent organic group" is one from the Z group.

Claim 2 and 3 have been amended to clarify that "the organic group in the general formula (1)" refers to the  $R^3$  group.

Claim 7 has been amended to delete the superfluous language "or (1').".

Claim 13 has been amended to change "the metal complex" to read "a metal complex," and Claim 16 has been amended to insert a "(2)" after the formula.

The rejection of claim 17 under 35 U.S.C. 112 has been overcome, since it has been amended to change the phrase "the ethylenically unsaturated group of the vinyl polymer" to read "an ethylenically unsaturated group of a vinyl polymer."

Furthermore, it is clear what  $R^{22}$  and  $R^{23}$  are, and how these groups are also connected to the vinyl monomer because monomers which may be used for the main chain of the polymer particularly are disclosed in the specification on page 7, line 5 through page 8, line 29.

Claim 18 has been amended to change “obtainable” to read “obtained,” as suggested by the Examiner.

Claims 1-4, 6-9 and 11-18 were rejected under 35 U.S.C. 103 (a) as being unpatentable over European ‘036 in view of U.S. Patent No. 5,112,881 to Mandal, et al., U.S. Patent No. 4,638,018 to Bauduin, et al., U.S. Patent No. 4,273,851 to Muzyczko, et al., and/or U.S. Patent No. 3,867,318 to Nishikubo, et al. The cited references do not render obvious the above claims since, among other things, none of the references provide any suggestion or motivation to combine their teachings to arrive at the present invention.

EP 0789036 suggests “alkenyl groups,” but all of the “alkenyl group” specifically mentioned in EP ‘036 are the ones having the “ $=CH_2$ ” structure at its terminus, inclusive of (meth) acryloyl groups (See page 5, lines 22-28; page 6, lines 4-10; page 7, lines 23-31; and page 8, lines 27-33). Thus EP ‘036 discloses only alkenyl groups having the “ $=CH_2$ ” moiety.

On the other hand, the claimed alkenyl groups, which is represented by the general formula (1), have a structure of “ $=CR^2R^3$ ” at its terminus. Here  $R^3$  is a univalent organic group containing 1 to 20 carbon atoms and cannot be a hydrogen atom. Therefore, it is clear that the “alkenyl group” disclosed in EP ‘036 differs quite significantly from the claimed alkenyl group represented by the general formula (1).

EP ‘036 states that “a polymer having alkenyl groups at the chain ends can be cured using a polyvalent hydrogensilicon compound as a curing agent or by photopolymerization” (See page 2, lines 10-15). However, the relation or connection between photopolymerizability of polymers and specific structures of alkenyl groups are not described at all. EP ‘036 merely discloses that the alkenyl group having “ $=CH_2$ ” moiety can be used for photopolymerization, since it discloses only alkenyl groups having “ $=CH_2$ ” moiety. Namely, although EP ‘036 may suggest to use the alkenyl group having “ $=CH_2$ ” moiety in lieu of the disclosed (meth)acryloyl group, EP ‘036 does not provide any motivation or suggestion for using the alkenyl groups other than ones having

"=CH<sub>2</sub>" moiety.

Mandal, Bauduin, Muzyczko and Nishikubo state that the cinnamoyl group has photopolymerizability, but they do not disclose that the cinnamoyl group is preferred to (meth)acryloyl group. MPEP 2143.01 says, "The prior art must suggest the desirability of the claimed invention." Thus, the above 4 references do not provide any motivation or suggestion to use the alkenyl groups represented by the general formula (1), including a cinnamoyl group, in lieu of a (meth)acryloyl group.

Therefore, the cited references do not provide any motivations or suggestions to combine the teachings of the references.

Consequently, the present invention is not obvious over EP 0789036 in view of Mandal, Bauduin, Muzyczko and/or Nishikubo.

The mere fact that cited art may be modified in the manner suggested by the Examiner does not make this modification obvious, unless the cited art suggest the desirability of the modification. No such suggestion appears in the cited art in this matter. The Examiner's attention is kindly directed to *In re Lee*, 61 USPQ2d 1430 (Fed. Cir. 2002), *In re Dembiczak et al.* 50 USPQ2d. 1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d. 1397 (Fed. Cir. 1989) and *In re Fritch*, 23, USPQ2d. 1780 (Fed. Cir. 1992).

In *Dembiczak et al.*, supra, the Court at 1617 stated: "Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc., v. M3 Sys., Inc., 157 F.3d. 1340, 1352, 48 USPQ2d. 1225, 1232 (Fed. Cir. 1998) (describing 'teaching or suggestion motivation [to combine]' as in 'essential evidentiary component of an obviousness holding'), *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d. 1453, 1459 (Fed. Cir. 1998) ('the Board must identify specifically...the reasons one of ordinary skill in the art would have been motivated to select the references and combine them');..."

Also, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render a rejection under 35 USC 103 sustainable. The cited art fails to provide the

degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under 35 USC 103. See *Diversitech Corp. v. Century Steps, Inc.* 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 185 USPQ 774 (CCPA 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d. 1923 (Fed. Cir. 1990), *In re Antonie*, 195, USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

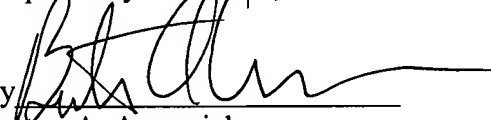
No property can be ignored in determining patentability and comparing the claimed invention to the cited art. Along these lines, see *In re Papesch*, supra, *In re Burt et al*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **“Version with markings to show changes made.”**

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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## ABSTRACT

A vinyl polymer having at least one group of the general formula (1) per molecule at the molecular chain terminus.



wherein Z represents an oxygen atom, a sulfur atom, a group of the formula NR', R' represents a univalent hydrocarbon group containing 1 to 20 carbon atoms, or a bivalent organic group containing 1 to 20 carbon atoms, and R represents a carbonyl group, a direct bond or a bivalent organic group containing 1 to 20 carbon atoms; R<sup>1</sup> and R<sup>2</sup> are the same or different and each represents a hydrogen atom or a univalent organic group containing 1 to 20 carbon atoms, and R<sup>3</sup> represents an organic group containing 1 to 20 carbon atoms; and a curable composition comprising the above vinyl polymer are provided.

**Version With Markings to Show Changes Made**

**IN THE TITLE:**

Please amend the title to read -- **POLYMERS HAVING REACTIVE FUNCTIONAL GROUP AT TERMINUS AND CURABLE COMPOSITIONS COMPRISING THE SAME** --.

**IN THE ABSTRACT:**

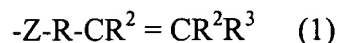
Please substitute the attached Abstract for the Abstract now in the application.

**IN THE CLAIMS:**

Please AMEND the claims as follows:

1. (Currently Amended) A vinyl polymer

having at least one group of the general formula (1) at a molecular chain terminus;



wherein Z represents an oxygen atom, a sulfur atom, a bivalent organic group containing 1 to 20 carbon atoms, or a group of the formula NR', R' represents an univalent hydrocarbon group containing 1 to 20 carbon atoms ~~or a bivalent organic group containing 1 to 20 carbon atoms~~; R represents a carbonyl group, a direct bond or a bivalent organic group containing 1 to 20 carbon atoms; R<sup>1</sup> and R<sup>2</sup> are the same or different and each represents a hydrogen atom or a univalent organic group containing 1 to 20 carbon atoms; R<sup>3</sup> represents a univalent organic group containing 1 to 20 carbon atoms.

2. (Currently Amended) The polymer according to Claim 1

wherein ~~the organic group~~ R<sup>3</sup> in the general formula (1) comprises a carbon atom, a hydrogen atom and 0 to 2 oxygen atoms.

3. (Currently Amended) The polymer according to Claim 2

wherein ~~the organic group~~  $R^3$  in the general formula (1) is a hydrocarbon group

7. (Twice Amended) The polymer according to Claim 1

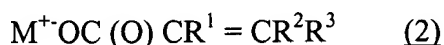
wherein  $R^1$  and  $R^2$  in the general formula (1) ~~or (1')~~ is the same or different and each represents a hydrogen atom or a methyl group.

13. (Currently Amended) The polymer according to Claim 12

wherein ~~the~~ a metal complex catalyst for said atom transfer radical polymerization is a complex of copper, nickel, ruthenium or iron.

16. (Twice Amended) The polymer according to Claim 1

which is ~~obtainable~~ obtained by substituting a compound of the general formula (2) for a terminal halogen group of vinyl polymer having a halogen atom at a molecular chain terminus;



wherein  $R^1$  and  $R^2$  are the same or different and each represents a hydrogen atom or a univalent organic group containing 1 to 20 carbon atoms;  $R^3$  represents a univalent organic group containing 1 to 20 carbon atoms;  $M^+$  represents an alkali metal ion or a quaternary ammonium ion.

17. (Currently Amended) The polymer according to Claim 16

wherein the terminal halogen-containing group of a vinyl polymer having a halogen atom at a molecular chain terminus is represented by the general formula (3);



wherein  $R^{22}$  and  $R^{23}$  each represents a group linked to ~~the~~ an ethylenically unsaturated group of the vinyl monomer; X represents a chlorine, a bromine or an iodine.



18. (Twice Amended) The polymer according to Claim 1

which is ~~obtainable~~ obtained by reacting a vinyl polymer having a hydroxyl group at a molecular chain terminus with a compound of the general formula (4);



wherein  $R^1$  and  $R^2$  are the same or different and each represents a hydrogen atom or a univalent organic group containing 1 to 20 carbon atoms;  $R^3$  represents a univalent organic group containing 1 to 20 carbon atoms; X represents a chlorine, a bromine or a hydroxyl group.

## ABSTRACT

~~The present invention is concerned with a~~ A vinyl polymer having at least one group of the general formula (1) per molecule at the molecular chain terminus.



wherein Z represents an oxygen atom, a sulfur atom, a group of the formula NR', R' represents a univalent hydrocarbon group containing 1 to 20 carbon atoms, or a bivalent organic group containing 1 to 20 carbon atoms, and R represents a carbonyl group, a direct bond or a bivalent organic group containing 1 to 20 carbon atoms; R<sup>1</sup> and R<sup>2</sup> are the same or different and each represents a hydrogen atom or a univalent organic group containing 1 to 20 carbon atoms, and R<sup>3</sup> represents an organic group containing 1 to 20 carbon atoms; and The present invention is further concerned with a curable composition comprising the above vinyl polymer are provided.